STATION PAPER NO. 18 AUGUST 1952

RE-ESTABLISHING PINE ON PIEDMONT CUT-OVER LAND

BY

E. V. BRENDER

AND

T. C. NELSON

SOUTHEASTERN FOREST
EXPERIMENT STATION
Asheville, North Carolina
E. L. Demmon,
Director

U. S. Department of Agriculture - Forest Service

RE-ESTABLISHING PINE ON PIEDMONT CUT-OVER LAND

by E. V. Brender and T. C. Nelson

The common practice of clear cutting merchantable-size pine stands frequently results in scrub hardwoods instead of a new crop of pines. The understory hardwoods, ever present in the merchantable pine stands of the Piedmont, soon close the canopy and exclude the successful establishment of pines. If a source of seed is available immediately after clear cutting, a new stand of pines may become established. However, it is estimated that at least 15 percent of the pine uplands in the southern Piedmont have reverted to brush and low value hardwoods. And this trend will increase as long as no provisions are made to restock the land with pine. Natural reseeding to pine can no longer be obtained on about two million acres, since a source of seed is not available or the understory hardwoods have obtained such a strong foothold as to preclude pine seedlings from becoming established. Planting will have to be resorted to if we want to grow pine on these acres. Even so, establishment of planted pines in recently cut-over woods, in competition with understory hardwoods, will never be as successful as old field planting. Some form of pretreating the planting site may be necessary to establish a satisfactory number of pines.

This paper deals with a study[1/] which had two major purposes: (1) to determine the effectiveness of certain preplanting treatments in permitting pines to come through hardwood competition, and (2) to compare survival and growth rate of planted loblolly and slash pine under the various treatments tested.

DESCRIPTION OF THE STUDY AREA

The study was carried out on the Casulon Plantation, near Bishop, Georgia. The area initially supported a stand of 90-year-old shortleaf pine, with understory hardwoods consisting chiefly of oaks, hickories, gums, and shrubby species such as dogwood, plum, haw and sumac. The understory hardwoods were small, mostly in the one-inch diameter class. On the average they gave direct overhead shade to over 17 percent of the area.

1/ The study was conducted in cooperation with the George Foster Peabody School of Forestry, University of Georgia, Athens.

Figure 1.--Merchantable stand of shortleaf pine with understory hardwoods.

Figure 2.--Pine overstory clear cut. Hardwoods dominate the area.

TREATMENTS

All of the merchantable pine was cut, leaving the understory hardwoods and a few scattered pine saplings. Immediately after removal of the pine overstory the area was treated and planted as follows:

Treatment A--control: Seedlings planted at 6 x 6-foot spacing, without prior treatment of hardwoods.

Treatment B--partial brush cutting and burning: All hardwoods 2 inches d.b.h. and larger were cut, the brush was piled, and the area was broadcast burned and planted at 6 x 6-foot spacing.

Treatment C--complete brush cutting: All hardwoods were cut, the brush left as it fell, and the area planted at 6 x 6-foot spacing.

Treatment D--complete brush cutting and grubbing: All hardwoods were cut and major roots and root collars grubbed out before planting at 6 x 6-foot spacing.

Treatment E--planted openings in the brush cover: Seedlings were planted in groups of three to six per opening, so that the same number of seedlings were planted as in 6 x 6-foot spacing.

The treatments were replicated in four randomized blocks, with 10 plots per block, each plot 0.15 acre in size. One plot in each treatment was planted to loblolly pine and the other to slash pine. The planted pine seedlings were remeasured at the end of the first, second, third, and fifth growing seasons. The seedling height was measured in tenths of feet; the position of seedlings (whether free growing, partially overtopped or completely overtopped) and the occurrence of fusiform rust and glaze damage were recorded.

RESULTS AT THE END OF THE FIFTH YEAR

The results at the end of the fifth year are summarized in tables 1 and 2. Number of trees have been converted to an acre basis to permit a more realistic comparison of degree of stocking.

Survival

Analysis shows that loblolly pine had a much higher survival rate under all conditions tested than slash pine. (This is also borne out by an old field planting on the Casulon Plantation with leftovers of the same planting stock, where loblolly had a survival of 86 percent as against 68 percent for slash pine.)

Table 1.--Survival and height growth of planted loblolly pines, by treatments

Treatment	All positions				Seedlings free to grow		
	Trees planted	Tree survival		Average height	Free seedlings	Survivors	Average height
	Number	Number	Percent	Feet	Number	Percent free	Feet
1/							
A	1114	701	62.9	7.01	526	75	7.57
B	1143	840	73.5	8.01	748	89	8.35
C	1128	704	62.4	7.60	605	86	7.94
D	1158	816	70.5	7.99	792	97	8.06
E	1136	720	63.4	7.36	540	75	7.88
All treatments combined			66.6	7.65		85	8.00

1/
A. Control
B. Partial brush cutting and burning
C. Complete brush cutting
D. Complete brush cutting and grubbing
E. Planted openings in brush cover

Table 2.--Survival and height growth of planted slash pines by treatments

Treatment	All positions				Seedlings free to grow		
	Trees planted	Tree survival		Average height	Free seedlings	Survivors	Average height
	Number	Number	Percent	Feet	Number	Percent free	Feet
A	1202	516	42.9	5.61	356	69	6.10
B	1136	605	53.3	5.96	429	71	6.44
C	1158	428	37.0	6.11	291	68	6.66
D	1158	623	53.8	6.59	561	90	6.81
E	1136	588	51.8	5.46	388	66	6.04
All treatments combined			47.7	5.86		73	6.35

Comparison of the results of the preplanting treatments showed that treatments B (partial brush cutting and burning) and D (complete brush cutting and grubbing) resulted in significantly higher survival than other treatments or the control.

The results are somewhat obscured since the source of seed of the planting stock of both species is unknown. However, the relatively greater survival and greater juvenile height growth of loblolly pine over slash pine is in agreement with the findings of other investigators.

A study made in the Alabama Piedmont (1) shows that loblolly grows faster than slash pine up to an age of nine to ten years. After that slash pine grows slightly faster than loblolly pine. The average survival for loblolly in the Alabama study was 83.2 percent, while for slash it was 52.9 percent.

Another study made in Tennessee (2) quotes survival of loblolly pine as 80 percent and slash pine as 47 percent.

In Central Louisiana (3) it was found that loblolly survived better than slash pine. At 10 years of age, planted loblolly exceeded slash pine in height by 3 feet on unburned areas, while on burned areas slash pine was 1 foot taller than loblolly pine.

At Watkinsville, Georgia (4) survival of 6-year-old loblolly pine was 88 percent, while that of slash pine was 61 percent. The respective heights were 13 feet and 10 feet.

Seedlings Free to Grow

Without cleaning, as indicated in table 1 by the number of free seedlings after 5 years of growth, loblolly pine planted in openings or without area preparation could not meet a standard of 600 free-growing seedlings per acre. Some brush or ground treatment is necessary, and the number of free seedlings appears to increase with intensity of treatment. Brush cutting alone is satisfactory, but 25 to 30 percent more free seedlings may be obtained with the additional treatment in burning or grubbing. Cleaning would assure well over 600 free seedlings per acre in any treatment class.

By the same standard, satisfactory stocking of slash pine cannot be expected without cleaning, although brush cutting followed by grubbing approaches it. The statistical difference between loblolly and slash pine in number of free seedlings per acre is highly significant.

Figure 3.--Loblolly pine seedling outgrowing hardwoods on check plot.

Figure 4.--Slash pine seedling free to grow.

Height Growth

Loblolly showed superior height growth over slash pine. Statistically, the difference is highly significant. The average height of the loblolly seedlings at the end of the fifth growing season was 7.65 feet, while slash pine was only 5.86 feet in height. The free seedlings averaged 8.00 feet, and 6.35 feet respectively. There is also a trend indicating that for both species the preplanting treatments stimulated height growth. The greater height of loblolly pine accounts in part for a greater percentage of free seedlings among survivors.

FUSIFORM RUST AND GLAZE DAMAGE

The study was not designed specifically to furnish information on damage from fusiform rust and glaze, but observations on these two items were collected and the results are given here.

Twenty-one percent of the slash pine had branch or stem cankers of fusiform rust as compared with 14 percent on loblolly pine. As for wind and glaze damage, 3 percent of the surviving slash pines were loose at the root-collar. Such seedlings are reclining at a small angle with the ground and have no chance of recovering. Less than 1 percent of the loblolly seedlings are in a leaning position. Their root-collars are firm, and most of them will straighten out.

SUMMARY AND CONCLUSIONS

Clear-cut upland pine stands which contain a relatively light understory of hardwoods can be successfully planted in the lower Piedmont to either loblolly or slash pine, provided the planting is done immediately after the clear cutting. In this study area, the amount of ground shaded by understory hardwoods increased from 17 percent to 34 percent during the first two growing seasons following the harvest cutting of the pine. Early release cuttings after planting are essential if adequate standards of survival and growth are expected.

Loblolly pine, under lower Piedmont conditions, survives better and displays greater juvenile height growth than slash pine. This conclusion cannot be accepted at its full value from this study alone, since the seed source of the planting stock of both species is unknown. However, other studies in the Piedmont confirm the superiority of loblolly pine.

Certain preplanting treatments proved to be helpful in establishing a greater number of seedlings, of either species, free from overhead shade. The most successful treatment was cutting and grubbing, which provided nearly 800 free loblolly seedlings per acre, and 560 free slash pine seedlings per acre. Cutting all hardwoods 2 inches and larger, followed by broadcast burning, provided about 750 free loblolly seedlings per acre, and 430 free slash pine seedlings per acre. The cutting of the brush alone was no better than no treatment.

It must be remembered that the preplanting treatments were applied on small plots with hand tools. In actual practice the cutting and grubbing treatment could be done with a Marden brush cutter or a similar machine. The cutting and burning treatment when carried out on a larger scale would also create a hotter burn. In either case, the expected results should be equally as good as those obtained on the small plots, or better. There are other modifications which would be applied under actual practice. For instance, hardwoods above 4 inches d.b.h. would more than likely be poisoned with ammate or 2,4,5-T. This would reduce competing sprouts which crowded out some planted pine seedlings in the test plots.

LITERATURE CITED

(1) Goggans, J. F.
1951 Slash and loblolly pine plantations in Alabama's Piedmont region. Agr. Expt. Sta., Ala. Polytech. Inst. Circ. No. 99.

(2) Huckenpahler, B. J.
1950 Development of nineteen-year old southern pine plantations in Tennessee. Jour. Forestry 48:722-723.

(3) Muntz, H. H.
1948 Slash pine versus loblolly in Central Louisiana. Jour. Forestry 46: 766-767.

(4) Hendrickson, B. H. and Gibbs, J. A.
1945 Sixth year progress report, field tests of farm woodland practices. So. Piedmont Soil and Water Cons. Expt. Sta., U. S. Soil Conservation Service.

Agriculture-Asheville